

Grants Mining District, NM

(b) (6)

Well Water Chemical/Radionuclide Results

Background

The EPA, as part of its investigation of ground water uranium contamination in the San Mateo Creek Basin, collected samples from several private water wells. The wells were tested to assess the chemical characteristic of the water and tested for the level of radionuclides, including uranium. Individual letters with results of the wells were sent to each of the well owners in July 2015. Additional information regarding the results are provided herein.

While the EPA regulates public water systems, it does not have the authority to regulate private drinking water wells. A private well that services a home is not required to meet the Federal Drinking Water Standards, but these standards can be used to evaluate the quality of drinking water. Households that use well water for drinking must take special precautions to ensure protection of their drinking water supply not only from chemicals and radionuclides but also from bacteria, viruses, parasites and microorganisms (See Attachment A).

Findings and Recommendations

Your water well designated as LSM-61, exceeded the health-based primary drinking water standards (i.e. MCL) for uranium and selenium and is considered unsafe for use as a drinking water supply. Some people who drink water containing uranium in excess of their MCLs over many years may have an increased risk of getting cancer.

Your water well exceeded the health-based primary drinking water standards (i.e. MCL) value for Nitrate + Nitrite as nitrogen and is considered not safe to drink. Infants below the

age of six months who drink water containing nitrate in excess of the MCL could become seriously ill.

According to the EPA¹, the following treatment method(s) have proven to be effective in removing radionuclides to levels below their MCLs:

- Beta particle and Photon Radiation: ion exchange and reverse osmosis;
- (Gross) Alpha Emitters: reverse osmosis;
- Radium 226 and Radium 228 (Combined): ion exchange, reverse osmosis, lime softening;
- Uranium: Ion exchange, reverse osmosis, lime softening, coagulation/filtration.

Your well water exceeded the secondary MCLs for total dissolved solids, sulfates and manganese. Secondary MCLs relate to aesthetic effects (color, odor, or taste). The EPA believes if contaminants are present in water at levels above their secondary MCL standards, the contaminants may cause the water to appear cloudy or colored, or to taste or smell bad. This may cause people to stop using water from their well water system even though the water is actually safe to drink.

According to the EPA², the following treatment method(s) have proven to be effective in reducing these contaminants below their Secondary MCLs:

¹ EPA web page

<http://water.epa.gov/drink/contaminants/basicinformation/radionuclides.cfm>

² EPA web page

<http://water.epa.gov/drink/contaminants/secondarystandards.cfm#five>

Conventional treatments like filtration removes metals like iron, manganese and zinc. Aeration removes odors, iron and manganese. Granular activated carbon will remove most of the contaminants which cause odors, color, and foaming.

Non-conventional treatments like distillation, reverse osmosis and electrodialysis are effective for removal of chloride, nitrates, total dissolved solids and other inorganic substances.

As for animal health or questions regarding animal health, please contact your county extension services.³

Human Health Evaluation for the Consumption of Produce, Beef, Milk, Poultry and Egg

Because water from your well may be used to grow crops or for livestock, the EPA also evaluated the potential cancer risk to human health from indirect exposure to radionuclides from the consumption of produce, beef, milk, poultry and eggs.

The total estimated risk was calculated by summing up all cancer risks from radionuclides of concern through all assumed potential indirect exposure pathways. The total estimated excess cancer risk for radionuclides in your well water from consumption of produce, beef, milk, poultry and eggs was below the EPA's acceptable upper end of the risk range. Therefore consumption of produce from your private garden, beef, milk, poultry and eggs from animals raised on your property does not present a health hazard.

Your well water can be used to irrigate your vegetable garden and water your animals.

However, the high TDS and sulfates in LSM-62 might prohibit its use for irrigating plants over many years.

Comparison to Primary and Secondary Maximum Contaminant Level (MCL⁴)

The attached table contains the primary and secondary MCL values and potential health effects associated with exposures above the MCL. Your well water results were compared with MCL values.

Below are some examples of comparing your results to MCL values:

First, know that your well water should not present a health hazard for radium.

The MCL for Ra-226 plus Ra-228 combined is 5 picocuries per liter (pCi/L). The results from your well water has a Ra-226 = 1.16 pCi/L and Ra-228 = 0.94 pCi/L for a combined sum of 2.10 pCi/L. The total of 2.10 pCi/L is less than the MCL of 5 pCi/L for radium 226 and radium 228 combined. Therefore, the radium 226 and radium 228 levels in your well water should not present a health hazard.

The MCL for total uranium as a metal is 0.030 milligrams per liter (mg/L). The total uranium in your well water was 0.061 mg/L. Some people who drink water containing uranium in excess of their MCLs over many years may have an increased risk of getting cancer.

Dissolved Radon Gas in Well Water

Only about 1-2 percent of radon in indoor air comes from drinking water sources. However breathing radon released to air from tap water increases the risk of lung cancer over the course of your lifetime. Drinking water containing radon also presents a risk of developing internal organ cancers, primarily stomach cancer. However, the risk of internal

³ Cibola County Extension Services phone number 505-287-9266. web page <http://cibolaextension.nmsu.edu/>

⁴ MCL = maximum contaminant level are national drinking water regulation standards.

organ cancers is smaller than the risk of developing lung cancer from radon released to air from tap water.

Currently there is no state or federal regulatory standard for radon in drinking water, however, the EPA has proposed to require community water suppliers to provide water with radon levels no higher than 4,000 pCi/L, which contributes about 0.4 pCi/L of radon to indoor air. The EPA also proposed a standard of 300 pCi/L which contributes about 0.03 pCi/L of radon to indoor air, for communities without indoor air radon outreach programs.

Radon level in your wells LSM-61 and LSM-62 was measured and found to be 55.8 pCi/L and 779 pCi/L respectively. Well LSM-62 had radon level higher than the 300 pCi/L but lower than the 4,000 pCi/L. Again the greatest risk from radon in drinking water is from the radon that escapes to the indoor air.

If you haven't tested your home for radon in air, contact your State. Radon test kits can be purchased by New Mexico residents online using the "New Mexico Radon Program" link at www.drhomeair.com or by calling 1-800-324-5928 and following the instructions for "The State of New Mexico Radon Test Kit Program" option.

For more information on radon gas refer to "A Citizen's Guide to Radon" at the following the EPA web page
<http://www.epa.gov/radon/pubs/citguide.html>

Attachment A

Human Health⁵

The first step to protect your health and the health of your family is learning about what may pollute your source of drinking water. Potential contamination may occur naturally, or as a result of human activity.

What are Some Naturally Occurring Sources of Contamination?

- **Microorganisms:** Bacteria, viruses, parasites and other microorganisms are sometimes found in water. Shallow wells — those with water close to ground level — are at most risk. Runoff, or water flowing over the land surface, may pick up these pollutants from wildlife and soils. This is often the case after flooding. Some of these organisms can cause a variety of illnesses. Symptoms include nausea and diarrhea. These can occur shortly after drinking contaminated water. The effects could be short-term yet severe (similar to food poisoning) or might recur frequently or develop slowly over a long time.
- **Radionuclides:** Radionuclides are radioactive elements such as uranium and radium. They may be present in underlying rock and ground water
- **Radon:** Radon is a gas that is a natural product of the breakdown of uranium in the soil — can also pose a threat. Radon is most dangerous when inhaled and contributes to lung cancer. Although soil is the primary source, using household water containing Radon contributes to elevated indoor Radon levels. Radon is less dangerous when consumed in water, but remains a risk to health.
- **Nitrates and Nitrites:** Although high nitrate levels are usually due to human activities (see below), they may be found naturally in ground water. They come from the breakdown of nitrogen compounds in the soil. Flowing ground water picks them up from the soil. Drinking large amounts of nitrates and nitrites is particularly threatening to infants (for example, when mixed in formula).
- **Heavy Metals:** Underground rocks and soils may contain arsenic, cadmium, chromium, lead, and selenium. However, these contaminants are not often found in household wells at dangerous levels from natural sources.
- **Fluoride:** Fluoride is helpful in dental health, so many water systems add small amounts to drinking water. However, excessive consumption of naturally occurring fluoride can damage bone tissue. High levels of fluoride occur naturally in some areas. It may discolor teeth, but this is not a health risk.

⁵ Source is from EPA web page <http://water.epa.gov/drink/info/well/health.cfm>

Maximum Contaminant Level (MCL) for Drinking Water

Results for (b) (6) Well Water LSM-61 Compared to MCL Values				
Contaminant	Results (pCi/L) 1/7/2015	MCL or TT ¹ (pCi/L) ²	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Results Compared to MCL
Gross Alpha particles	U-Nat ³ =46.9 – 40.87 = 6.03 pCi/L	15 picocuries per Liter (pCi/L)	Increased risk of cancer	< MCL
Beta particles and photon emitters	Cs-137 ⁴ =17.4 pCi/L Sr-90 = 17.4 pCi/L Equivalent to 0.348 millirem per year	4 millirem per year	Increased risk of cancer	< MCL
Radium 226 and Radium 228 (combined)	Ra-226=1.16 Ra-228=0.94 Combined=2.10	5 pCi/L	Increased risk of cancer	< MCL
Radon	55.8	Proposed MCL 300/4000 pCi/L	Increased risk of cancer	See discussion in letter
Uranium	61 µg/L	30 µg/L as of 12/08/03	Increased risk of cancer, kidney toxicity	> MCL

Results for (b) (6) Well Water LSM-61 Compared to MCL/RSL Values						
Inorganic Chemicals	Results (mg/L)	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Re Co to

Results for (b) (6) Well Water LSM-61 Compared to MCL/RSL Values						
Inorganic Chemicals	Results (mg/L)	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Re Co to
Aluminum	0.02	-----	0.05 to 0.2		Colored water	< S
Antimony	0.001 U	0.006			Increase in blood cholesterol; decrease in blood sugar	ND
Arsenic	0.003	0.010 as of 01/23/06			Skin damage or problems with circulatory systems, and may have increased risk of getting cancer.	< M
Barium	0.1 U	2			Increase in blood pressure	ND
Beryllium	0.001 U	0.004			Intestinal lesions	ND
Cadmium	0.001 U	0.005			Kidney damage	ND
Chromium (total)	0.001 U	0.1			Allergic dermatitis	ND
Chloride	16	-----	250		Salty taste	< S
Copper	0.01 U	1.3 TT ⁶ ; Action Level=1.3	1.0		Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level. Metallic taste; blue-green stain	ND

Results for (b) (6) Well Water LSM-61 Compared to MCL/RSL Values						
Inorganic Chemicals	Results (mg/L)	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Re Co to
Fluoride	0.34	4	2		Bone disease (pain and tenderness of the bones); Children may get mottled teeth. Tooth discoloration above the secondary MCL.	<
Iron	NA	-----	0.3		Rusty color; sediment; metallic taste; reddish or orange staining.	NA
Lead	0.001 U	TT ⁶ ; Action Level=0.015			Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities Adults: Kidney problems; high blood pressure	ND
Manganese	0.053	-----	0.05		Black to brown color; black staining; bitter metallic taste.	> M
Mercury (inorganic)	0.0002 U	0.002			Kidney damage	ND
Molybdenum	0.001 U			0.1	Increased uric acid in blood- Gout	ND
Nickel	0.01 U			0.390	Decreased body and organ weights	ND
Nitrate (measured as Nitrogen)	NA	10			Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	NA

Results for (b) (6) Well Water LSM-61 Compared to MCL/RSL Values						
Inorganic Chemicals	Results (mg/L)	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Re Co to
Nitrite (measured as Nitrogen)	NA	1			Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	NA
Nitrate + Nitrite as Nitrogen	1.6	1			Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	>M
pH	7.97	-----	6.5-8.5		Low pH: bitter metallic taste; corrosion high pH: slippery feel; soda taste; deposits	Wi ran
Selenium	0.057	0.05			Hair or fingernail loss; numbness in fingers or toes; circulatory problems	> M
Silver	0.001 U	-----	0.1		Skin discoloration; graying of the white part of the eye	ND
Sulfate	100	-----	250		Salty taste	<S
Thallium	0.001 U	0.002			Hair loss; changes in blood; kidney, intestine, or liver problems	ND
Total Dissolved Solids (TDS)	444	-----	500		Hardness; deposits; colored water; staining; slightly salty taste	<S
Vanadium	0.001 U			0.086	Decreased hair cysteine- brittle hair	ND
Zinc	0.01	-----	5		Metallic taste	ND

Maximum Contaminant Level (MCL) for Drinking Water

Results for (b) (6) Well Water LSM-62 Compared to MCL Values				
Contaminant	Results (pCi/L) 1/7/2015	MCL or TT ¹ (pCi/L) ²	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Results Compared to MCL
<u>Gross Alpha particles</u>	U-Nat ³ =13.3 – 12.06 =1.24 pCi/L	15 picocuries per Liter (pCi/L)	Increased risk of cancer	< MCL
<u>Beta particles and photon emitters</u>	Cs-137 ⁴ =11.4 pCi/L Sr-90 = 11.4 pCi/L Equivalent to 0.228 millirem per year	4 millirem per year	Increased risk of cancer	< MCL
<u>Radium 226 and Radium 228 (combined)</u>	Ra-226=0.14 Ra-228=0.28 Combined=0.42	5 pCi/L	Increased risk of cancer	< MCL
Radon	779	Proposed MCL 300/4000 pCi/L	Increased risk of cancer	See discussion in letter
<u>Uranium</u>	18 µg/L	30 µg/L as of 12/08/03	Increased risk of cancer, kidney toxicity	< MCL

Results for (b) (6) Well Water LSM-62 Compared to MCL/RSL Values

Inorganic Chemicals	Results (mg/L) 1/7/2015	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Results Compared to MCL
Aluminum	0.01 U	-----	0.05 to 0.2		Colored water	ND
Antimony	0.001 U	0.006			Increase in blood cholesterol; decrease in blood sugar	ND
Arsenic	0.001 U	0.010 as of 01/23/06			Skin damage or problems with circulatory systems, and may have increased risk of getting cancer.	ND
Barium	0.1 U	2			Increase in blood pressure	ND
Beryllium	0.001 U	0.004			Intestinal lesions	ND
Cadmium	0.001 U	0.005			Kidney damage	ND
Chromium (total)	0.001 U	0.1			Allergic dermatitis	ND
Chloride	49.8	-----	250		Salty taste	< SMCL
Copper	0.01 U	1.3 TT ⁶ ; Action Level=1.3	1.0		Short term exposure: Gastrointestinal distress. Long term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level. Metallic taste; blue-green stain	ND
Fluoride	0.45	4	2		Bone disease (pain and tenderness of the bones); Children may get mottled teeth. Tooth discoloration	< MCL

Results for (b) (6) Well Water LSM-62 Compared to MCL/RSL Values						
Inorganic Chemicals	Results (mg/L) 1/7/2015	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Results Compared to MCL/RSL
					above the secondary MCL.	
Iron	0.087	-----	0.3		Rusty color; sediment; metallic taste; reddish or orange staining.	< SM
<u>Lead</u>	0.001 U	TT ⁶ ; Action Level=0.015			Infants and children: Delays in physical or mental development; children could show slight deficits in attention span and learning abilities Adults: Kidney problems; high blood pressure	ND
Manganese	0.018	-----	0.05		Black to brown color; black staining; bitter metallic taste.	< SM
<u>Mercury (inorganic)</u>	0.0002 U	0.002			Kidney damage	ND
Molybdenum	0.003			0.1	Increased uric acid in blood- Gout	< RSL
Nickel	0.016			0.390	Decreased body and organ weights	< RSL
<u>Nitrate (measured as Nitrogen)</u>	NA	10			Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	NA
<u>Nitrite (measured as Nitrogen)</u>	NA	1			Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms	NA

Results for (b) (6) Well Water LSM-62 Compared to MCL/RSL Values						
Inorganic Chemicals	Results (mg/L) 1/7/2015	Primary MCL ¹ or TT ¹ (mg/L) ²	Secondary MCL (SMCL) ¹ (mg/L) ²	RSL ⁵ Non-cancer Child (mg/L)	Potential Health Effects from Long-Term Exposure Above the MCL (unless specified as short-term)	Results Compared to MCL/RSL
					include shortness of breath and blue-baby syndrome.	
Nitrate + Nitrite as Nitrogen	15	1			Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	>MCL
pH	7.63	-----	6.5-8.5		Low pH: bitter metallic taste; corrosion high pH: slippery feel; soda taste; deposits	Within range
Selenium	0.005 U	0.05			Hair or fingernail loss; numbness in fingers or toes; circulatory problems	ND
Silver	0.001 U	-----	0.1		Skin discoloration; graying of the white part of the eye	ND
Sulfate	2030	-----	250		Salty taste	>SMCL
Thallium	0.001 U	0.002			Hair loss; changes in blood; kidney, intestine, or liver problems	ND
Total Dissolved Solids (TDS)	3340	-----	500		Hardness; deposits; colored water; staining; slightly salty taste	>SMCL
Vanadium	0.001 U			0.086	Decreased hair cysteine- brittle hair	ND
Zinc	0.06	-----	5		Metallic taste	< MCL

Definitions:

¹Maximum Contaminant Level (MCL) - The highest level of a contaminant that is allowed in drinking water. Primary MCL refers to health-related effects and are enforceable standards.

¹Secondary MCL (SMCL) refers to aesthetic (taste, odor, or color) effects and are non-enforceable guidelines.

¹Treatment Technique (TT) - A required process intended to reduce the level of a contaminant in drinking water.

² Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (PPM). pCi/L = picocuries per liter.

U = Not detected (ND) at the reported detection level.

³ Gross Alpha particle does not include alpha particles from uranium. Subtract uranium in pCi/L ($18 \mu\text{g/l} \times 0.67 \text{ pCi}/\mu\text{g} = 12.06 \text{ pCi/L}$) from the gross alpha results and then compare to MCL value.

⁴ A reasonable assumption is made here that the source of beta particles is a natural source and not man made. The energies of the natural source are expected to be closer to the Cs-137 energy than it is for Sr-90. Therefore the activity from Cs-137 as a reference was selected to represent activities coming from beta particles produced from natural decay progenies of Uranium.

⁵ RSL = Regional Screening Level; Non-cancer effects; child exposure through the ingestion/dermal routes.

⁶ Lead and copper are regulated by a treatment technique that requires systems to control the corrosiveness of their water. If more than 10% of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

NA = Not Available

< Less than;

> Greater than.

For more information, go to the EPA website <http://water.epa.gov/drink/contaminants/index.cfm>